








“Identifying changes in insurance companies’ competitiveness on the travel services market”

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IDENTIFYING CHANGES IN INSURANCE COMPANIES' COMPETTIVENESS ON THE TRAVEL SERVICES MARKET

Abstract

The purpose of the study is to develop methodological approach for identifying changes in the level of insurance companies' competitiveness on the travel services market. Based on development of multifactor regression equation, integrated indicators of insurance companies' competitiveness in 2016–2019 were calculated. The application of three-sigma rule allowed to divide insurance companies by competitiveness levels and to identify that during 2016–2019 most of insurers had sufficient and critical levels of competitiveness and the group of insurance companies with a high level of competitive position is small. The Markov chain theory was used as a research method to determine the probability of insurance companies moving to higher or lower competitiveness levels. The results of Markov's method showed that the majority of insurance companies are most likely to remain in their initial groups and only insurers with low and sufficient competitiveness have high probability to change their positions. Companies with high competitiveness have very strong positions on the market and there is very low probability that other insurers will capture leaders' market share in the coming years. So, the use of the developed approach allows predicting a decrease of insurance ability to compete on the travel services market and deciding on the necessity to change the competitive strategy.

Keywords

level of competitiveness, Markov chain, market share,
transition probability matrix

JEL Classification

G17, G22, M31

INTRODUCTION

Management of insurance companies is focused on developing new or improving existing insurance products that are relevant at the moment. Considering the significant growth potential of travel industry, it is promising to insure the risks related with the provision of travel services. In the context of the COVID-19 pandemic, the global travel market will decline by 58-78% in 2020, while its recovery is planned for the third quarter of 2021 (UNWTO, 2020), so insurers must be ready to face a challenge and keep their own competitive position on the market.

The continuous activity of insurance companies on the travel services market, especially in the conditions of dynamic changes of current economic situation, requires constant monitoring of competitiveness level and forecasting the dynamics of change. The effectiveness of competitiveness management depends on taking into account trends in the level of industry competition, flexibility and efficiency of management decisions. The top management of insurance company must predict a critical level of competitiveness in order to develop and implement measures to improve it. In this regard, it is important to detect early changes in the level of insurance companies' competitiveness on the travel services market and probability of competitors' attack.

1. LITERATURE REVIEW

New view on the assessment of the competitive environment of the insurance market was presented by Kneysler et al. (2019) who offered a scientific methodological approach to assessing the market environment with the use of an integrated indicator of the voluntary health insurance market competitiveness. The proposed integrated indicator allows to make a comprehensive investigation of market behavior of the market participants and to reveal the problematic tendencies of its competitive environment.

Scientific statements of Širá (2012) determined main factors of insurance companies' competitiveness, such as financial situation, human resources, innovation system and information infrastructure. In addition, scientist quantified the level of competitiveness of selected insurance businesses and suggested a sequence, how managers can use the index of insurance commercial competitiveness in practice to determine their current position.

Lee et al. (2018) contributes to the existing literature by examining the insurers competitiveness. Panzar-Rosse (P-R) H-statistic method is used to evaluate the degree of competition. This method is more practical to assess the level of competitiveness as it takes into the account of changes in insurers rates to reflect the variation in revenues to reveals the firm's capability to pass on increases in rates to consumers.

Dyakonova et al. (2020) focused on quantitative methods of insurance companies' competitiveness estimation in the context of sustainable development based on optimization of the insurance portfolio, which includes determining the rational combination of insurers services share in companies' portfolios, analysis of demand on certain types of services, taking into account market restrictions, demand and needs, the choice of rational combination prices and sales volumes. Proposed quantitative estimation of insurance companies' competitiveness determines the prospects for their further development in the context of sustainable development.

Mamedova (2018) also developed a new method for calculation of integral competitiveness indi-

cator and a methodical approach for identifying the classes of insurers competitiveness based on cluster and discriminatory analyses. Unlike other investigations, scientist took into account the specifics of the insurer companies' activity on travel services market in the assessing of competitiveness and proved that the attractiveness of travel insurance depends not only on the size of the insurance rate, but also on the quality of insurance companies' services and reliability of insurance protection.

Important theoretical, methodological, scientific and practical statements about competitiveness forecasting were presented in investigations regarding companies operating in different sectors of economy. Fedyn et al. (2012) developed neural network model of expert system for comparative assessment and forecasting of products competitiveness based on two factors (price and quality). The practical implementation of the model is carried out on the example of household refrigerators.

In the context of reputation capital theory development, one should note the scientific results, obtained by Kozlovskiy et al. (2019), which consist in developing economic-mathematical model of forecasting the state and level of competitiveness with the dynamic change of the linguistic parameters of the model. This model makes it possible to make a linguistic assessment of competitiveness factors that influence the effectiveness of managerial decisions that are not quantifiable, which is especially relevant today.

Khalimon (2018) improved approach for forecasting the competitive development of telecommunications enterprises considering hierarchical levels of external and internal factors using an extrapolation method, which is based on developing of a matrix to forecast scenarios of competitive development.

The competitiveness forecasting method proposed by Kryvorotov et al. (2017) is based on a scenario approach taking into consideration conditions of country's economy and key markets development.

Extrapolation method was used by Pavlova and Hubariev (2013) in order to forecast competitiveness of machine-building enterprises based on the

growth curves of their economic dynamics under the condition of positive characteristics of main indicators and invariance of parameters in the past.

Sidorin (2013) proposed an approach for forecasting the competitiveness of innovative products based on a combination and vector representation of a set of main product competitiveness indicators, such as cost, price, quality and additional features, that can satisfy implicit and latent customers' needs.

To solve the problem of forecasting the competitiveness, Varshavska (2018) proposed to use economic and mathematical models of a new type that allow to conduct problem-oriented search, analyze information and provide the user with information in an accessible form.

Considering the variability of government policy and modern challenges that bring instability to the development of travel services market, there is an urgent need to expand methodological approaches for assessing and forecasting the insurance companies' competitiveness as the main basis for keeping and even expanding competitive positions on the market.

2. AIMS

The study aims to develop methodological approach for identifying changes in the level of insurance companies' competitiveness on the travel services market.

3. METHODOLOGY

The study is based on Markov chain method to determine trends in changing levels of systems development, the essence of which is to analyze a matrix of transition probabilities, where each element represents a probability of moving from state n to state m . According to this method, a set of insurance companies is distributed between target years. After that, insurance companies are ranked in ascending order and in the resulting distribution insurance companies are divided by levels of competitiveness (quantiles for each year separately).

The result is a matrix of probabilities of insurance company transition from one level of competitiveness on the market of tourist services to another. The probability of transition is defined as a ratio of frequency of transitions to the initial number of insurers in a group (formula 1).

$$P = \frac{n_{in}}{N_{io}}, \quad (1)$$

where n_{in} – a number of insurance companies moved from group i to group j ; N_{io} – a number of insurance companies in the group i at the initial time.

To assess the competitiveness of insurance companies on the travel services market it was conducted multifactor regression analysis, where dependent variable is a position of insurance companies on travel services market determined on the matrix approach (Mamedova, 2019) and independent variables are main components of Ukrainian insurance companies' competitiveness on travel services market identified by factor analysis (Mamedova, 2018). Authors used statics of 50 Ukrainian insurers in 2016–2019 and Data Analysis tab in Microsoft Excel to conduct the regression analysis. Parameters of the regression model and indicators of its statistical significance are given in Table 1.

Evaluation of the statistical significance of the model parameters by Student's criterion (comparison of t-statistical value with critical or tabular, which is 1.97 at $\alpha = 0.05$ and $k = 198$) allowed to conclude that all indicators in the model are statistically significant. In general, Student's statistics shows how many times the calculated parameter exceeds its standard error.

To substantiate the significance of the calculated parameters of the model, values of β -coefficients were compared with their standard errors. In the developed model, the obtained estimates are not unbiased, as all β -coefficients exceed the standard errors.

The "p-level" coefficient shows probability that a critical t-test may be greater than a calculated one (the probability of statistical insignificance of the regression level parameters). Since the "p-level" for all coefficients does not exceed $\alpha = 0.05$ (se-

Table 1. Parameters of the regression model for calculating the indicator of insurance companies' competitiveness on the travel services market

Equation parameter	Indicator									
	β -coefficient	B-coefficient	t-statistical	t-table	Multiple R	R-square	Standard error	P-value	F	F-table
Intercept	-	0.37	0.71	1.97	0.84	0.71	0.17	0.04	12.65	3.61
x_1	0.110	1.12	1.07				1.07	0.02		
x_2	0.170	1.28	1.40				1.04	0.01		
x_3	0.003	0.02	0.02				0.01	0.03		
x_4	0.342	2.50	1.19				2.19	0.00		
x_5	0.347	3.59	1.83				2.83	0.01		
x_6	0.205	1.59	1.84				1.14	0.03		

lected level of significance), they are statistically significant.

The quality of the model and its adequacy are checked on the basis of determination coefficient (R^2) and multiple regression (R). The obtained value of the determination coefficient indicates that 71% of dependent variable's variance is described by the constructed model. In turn, the multiple regression coefficient is equal to 0.84, which indicates a close linear relationship between the resultant feature and the set of factor features.

Fisher's F-test is also used to assess the significance of the regression equation. Comparing F-actual = 12.65 with F-theoretical = 3.61, it can be concluded that the calculated value is several times higher than the critical value, which indicates that the linear connection between Y and independent factors is statistically significant.

In the Table 1 B-coefficients are indicators before independent variables in the model for assessing the competitiveness of insurance companies on travel services market (formula 2).

$$Y = 0.373 + 1.062 \cdot x_1 + 1.151 \cdot x_2 + 0.316 \cdot x_3 + 1.873 \cdot x_4 + 3.615 \cdot x_5 + 1.737 \cdot x_6, \quad (2)$$

where Y – general indicator of insurance companies' competitiveness on travel services market; x_1 – indicator of competitiveness by component of

travel insurance attractiveness for consumers; x_2 – indicator of competitiveness by price component; x_3 – indicator of competitiveness by component of place and method of distribution; x_4 – indicator of competitiveness by promotion component; x_5 – indicator of competitiveness by component of personal proficiency; x_6 – indicator of competitiveness by component of psychological perception.

Based on the calculated values of β -coefficients in table. 1, a regression model was built in a standardized scale (formula 3). The relation of multiple regression coefficients b_i with standardized coefficients β_i is described by the ratio:

$$\beta_i = B_i \cdot \frac{\sigma_{xi}}{\sigma_y}, \quad (3)$$

β -coefficients (standardized regression coefficients) were additionally calculated to assess the degree of factors variation included in the model and to evaluate the influence of factors on resultant indicator.

$$Y = 0.110 \cdot x_1 + 0.170 \cdot x_2 + 0.003 \cdot x_3 + 0.342 \cdot x_4 + 0.347 \cdot x_5 + 0.205 \cdot x_6, \quad (4)$$

β -coefficients (formula 3) are used to normalize the regression coefficients. The advantage of β -coefficients in comparison with B-coefficients is that β -coefficient allows to compare a contribu-

tion of each an independent variable to a forecast of a dependent variable. If value of β -coefficient is greater than 0, it indicates existence of direct relationship between an independent and a resulting variable, i.e., increase of x leads to increase of y . A negative β -factor indicates an inverse relationship between an independent variable and a resulting factor. Thus, based on β -coefficients, it was formed a rating of components significance that affect insurer's competitiveness in influence's decrease order: personal proficiency (x_5), promotion (x_4), psychological perception (x_6), price (x_2), travel insurance attractiveness (x_1), place and method of distribution (x_3).

The proposed equation of the integrated assessment of insurance companies' competitiveness on travel services market (formula 3) provides an analysis of key competitiveness components impact on dynamics of insurers competitive positions. It allows to determine a weight of each component in integrated indicator and to establish qualitative levels of insurers competitiveness, which is an analytical basis of managing its condition in the short- and long-term perspective.

4. RESULTS

Determining the significance of components impact on the integrated indicator of insurance companies' competitiveness on travel services market allowed to form a rating of components significance in order to reduce their impact: personal proficiency (x_5), promotion (x_4), psychological per-

ception (x_6), price (x_2), insurance attractiveness for consumers (x_1), place and method of implementation (x_3). The histogram of insurance companies' distribution by the integrated indicator of competitiveness in 2016–2019 is presented in Figure 1.

As can be seen from Figure 1, most insurance companies are concentrated in the range from 0.18 to 0.28 level of the integrated indicator and has competitiveness below average. Three Sigma rule was used to distribute the integrated indicator of insurance companies' competitiveness on the travel services market by different levels. According to Figure 1, it is hypothesized that the integral competitiveness indicator is not distributed according to the normal law, but with a certain asymmetry.

To prove this hypothesis, there were calculated indicators (Table 2) used to characterize the laws of random variables distribution (Vnukova et al., 2020).

As presented in Table 2, for the integrated indicator of competitiveness the values of mode, median and mean do not match. Since the skewness of distribution exceeds 0.5 and is positive, the index distribution has a right-hand asymmetry.

According to Three-sigma rule a scale for values distributed by normal law has a range $(\bar{x} - 3 \cdot \sigma; \bar{x} + 3 \cdot \sigma)$, but if values distribute with some asymmetry from the normal law, mode or median are used as starting point in scale calculation and also correction factor k (formula 5) is applied (Pukala et al., 2017).

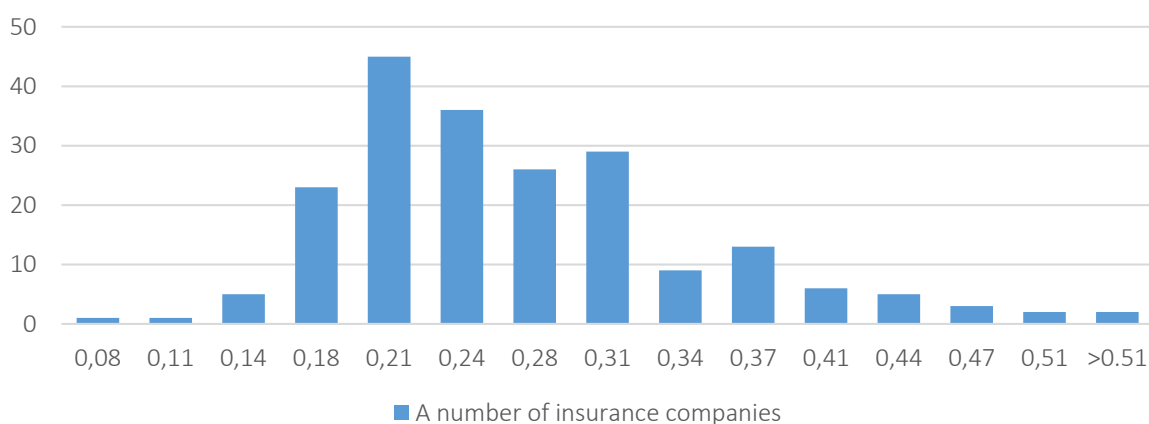


Figure 1. Distribution of insurance companies according to the integrated indicator of competitiveness on the travel services market

Table 2. Statistical characteristics of distribution of integrated indicator of insurance companies' competitiveness on travel services market

Indicator	Statistical characteristics of distribution					
	Average value	Median	Mode	Standard deviation	Dispersion	Skewness of distribution
Indicator of insurance companies' competitiveness	0.25	0.23	0.20	0.08	0.007	0.96

$$k = \frac{M - M_0}{M} / n, \tag{5}$$

where k – correction factor for right-sided asymmetry of indicators distribution, M_0 – mode, M – median, n – number of scale intervals on the right and left of the median.

According to Three-sigma rule interval scale with right-sided asymmetry has a range of values $(M - 3\sigma \cdot k; M + 3\sigma \cdot (k + 1))$, so boundaries of the middle interval at the five-level scale are equal to $(M - 3\sigma \cdot k/5; M + 3\sigma \cdot (k + 1)/5)$.

There were presented the results of developing scales of the integrated indicator of competitiveness according to the rule of “three sigma” and calculation of the asymmetry correction coefficient (Table 3).

The results of insurance companies' distribution by levels of competitiveness showed that during

2016–2019 the most numerous groups were insurance companies with a sufficient and a critical level of competitiveness. The group of insurance companies with a high level of competitive was small. This group included 5 insurers in 2019 (PJSC IC “PZU Ukraine”, PJSC “European Travel Insurance”, IC “Guardian”, PJSC IC “Providna”, PJSC IC “ARX”), 3 insurers in 2018 (PJSC IC “PZU Ukraine”, PJSC “European Travel Insurance”, PJSC IC “ARX”), 2 insurers in 2017 (PJSC IC “PZU Ukraine”, PJSC “European Travel Insurance”) and 4 insurers in 2016 (PJSC IC “PZU Ukraine”, PJSC “European Travel Insurance”, PJSC IC “Providna”, PJSC “UPSK”).

The proposed approach for assessing the insurance companies' competitiveness on the travel services market allows not only to conduct an integrated assessment, but also to identify criteria, results and factors that affect individual components of competitiveness, i.e. to identify weaknesses in insurers management.

Table 3. Scales of insurance companies' competitiveness on travel services market

Indicator	Levels of integrated indicator of insurance companies' competitiveness on travel services market				
	Critical	Low	Average	Sufficient	High
Integrated indicator of insurance companies' competitiveness on travel services market	[0; 0.22]	(0.22; 0.23]	(0.23; 0.28]	(0.28; 0.38]	(0.38; 1]

Table 4. Matrix of insurance companies moving between groups according to the levels of their competitiveness on the travel services market

Groups of insurance companies by levels of their competitiveness	The final state of insurers distribution according to levels of their competitiveness					Total	
	High	Sufficient	Average	Low	Critical		
The initial state of insurers distribution according to levels of their competitiveness	High	7 (63.6%)	2 (18.2%)	1 (9.1%)	0 (0.0%)	1 (9.1%)	11
	Sufficient	2 (5.9%)	20 (58.8%)	4 (11.8%)	3 (8.8%)	5 (14.7%)	34
	Average	1 (3.1%)	12 (37.5%)	13 (40.6%)	2 (6.3%)	4 (12.5%)	32
	Low	0 (0.0%)	0 (0.0%)	5 (31.3%)	4 (25.0%)	7 (43.8%)	16
	Critical	0 (0.0%)	4 (7.0%)	9 (15.8%)	9 (15.8%)	35 (61.4%)	57
	Total	10	38	32	18	52	–

Insurance companies were divided by levels of competitiveness and the dynamics of their assignment to a certain group was examined during 2016–2019, then there were determined the number of their stable positions and transitions to other groups, which identified the possibility of forming permanent groups by levels of competitiveness on the travel services market and probability of moving to another group. The movement of insurers between levels of competitiveness during 2016–2019 was reflected in the transition matrix (Table 1).

The proposed matrix (Table 4) shows how many times and in which groups the insurers moved in 4 years. The diagonal of the matrix shows a number of insurers who have not changed their positions in groups. To build a matrix of transition probabilities, it is necessary to divide each of transitions by initial number of states in a group. This creates

a matrix, which reflects the probability of insurers transition from one group to another.

Based on the analysis of the transition probabilities (Table 4), it can be concluded that insurance companies with high, sufficient, medium and critical competitiveness are most likely to remain in their initial groups, and insurers with low competitiveness are more likely to have critical or medium competitiveness. There is very low probability (less than 6%), that new companies will join a group of companies with high competitiveness. This indicates a strong position of leaders on the travel insurance market of Ukraine. For insurance companies with average level of competitiveness, there is a high probability (37.5%) to move to groups of companies with sufficient competitiveness. Thus, it should be noted a positive trend in increasing the number of insurers with strong positions on travel services market.

CONCLUSION

The paper proposed an approach to integrated assessment of insurance companies' competitiveness on the travel services market and its division by levels. Based on the application of the Markov chain, it was identifying the change in the level of insurers' competitiveness in next four years. It is established that Ukrainian insurance companies are quite stable in the division into groups according to the levels of competitiveness. There was revealed the strong positions of the leaders on travel services market and difficulties of insurers with lower competition to compete with them. Companies with sufficient competitiveness are unlikely to change their position in groups, but there is a significant risk of losing market share due to the high probability of insurers with average competitiveness to catch up with them in the competition. Group of companies with low competitiveness is the most unstable and risky due to an aggressive competitive strategy, they are more likely to lose or increase the attractiveness of their services to consumers than to maintain current competitiveness. The developed approach allows to predict changes in insurance ability to compete on the travel services market and make appropriate management decisions.

AUTHOR CONTRIBUTIONS

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